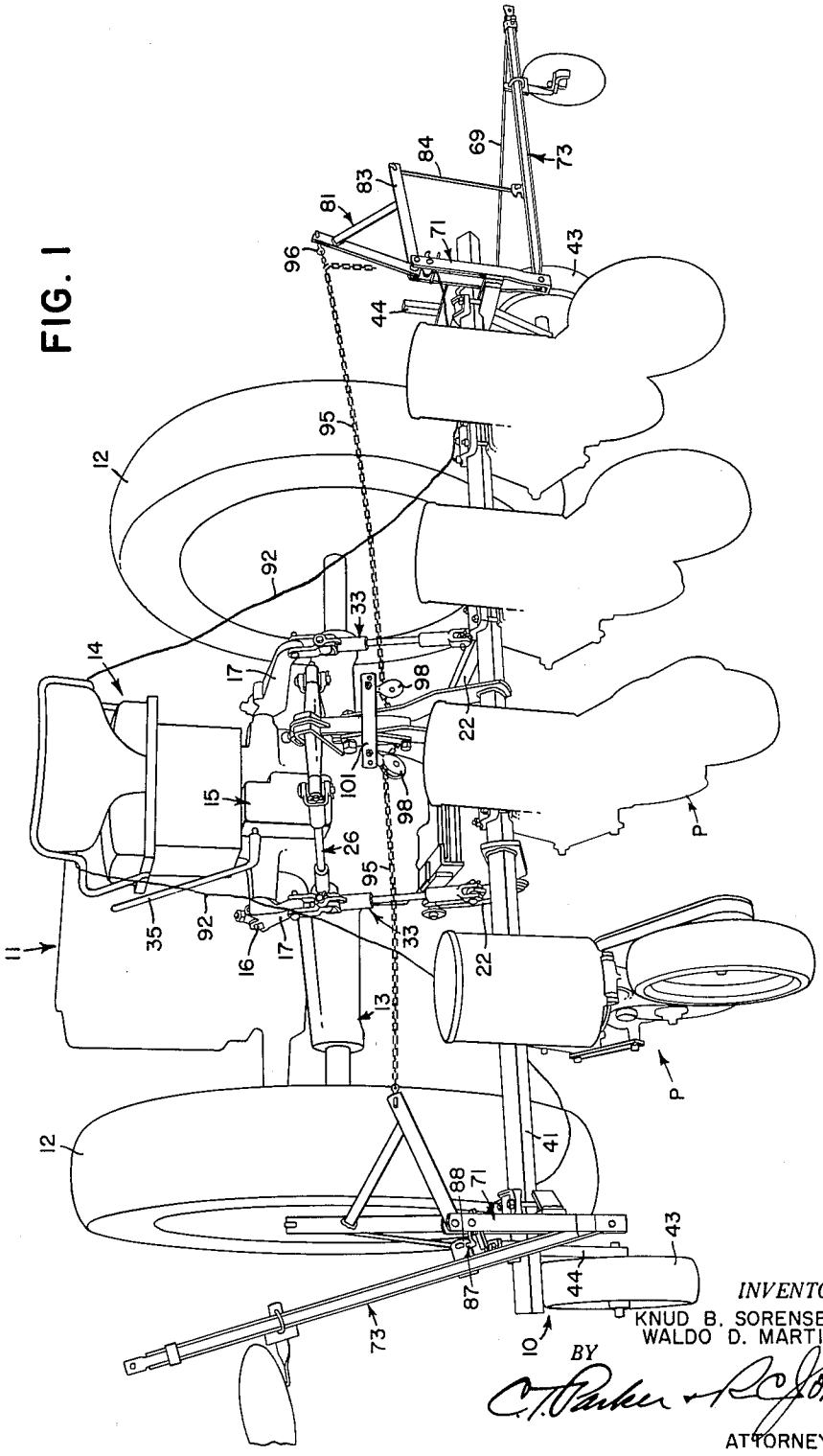
March 21, 1961 K. B. SORENSEN ET AL 2,975,840

MARKERS FOR PLANTERS

Filed Oct. 8, 1956 3 Sheets-Sheet 1

FIG. 1



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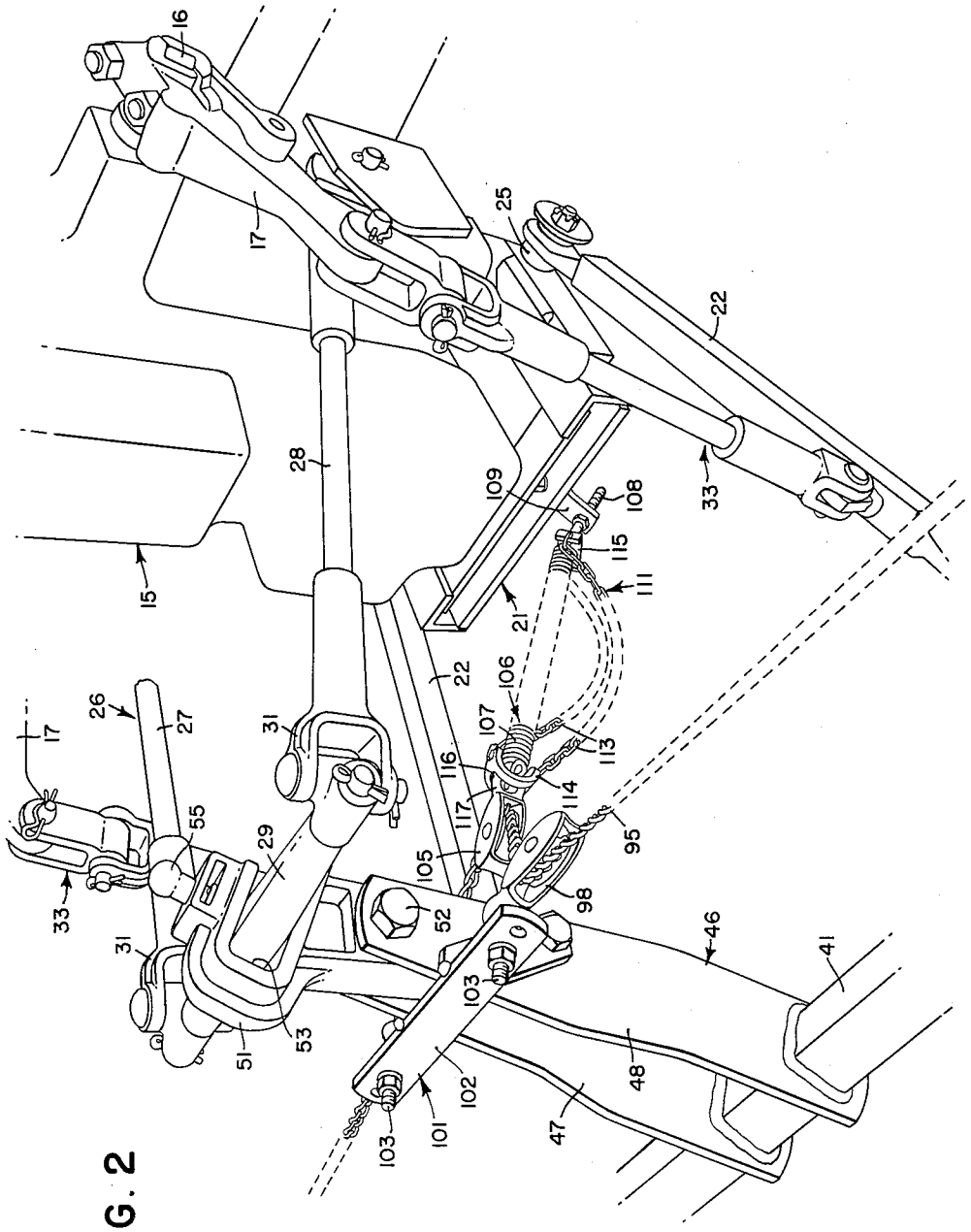


FIG. 2

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MARKERS FOR PLANTERS

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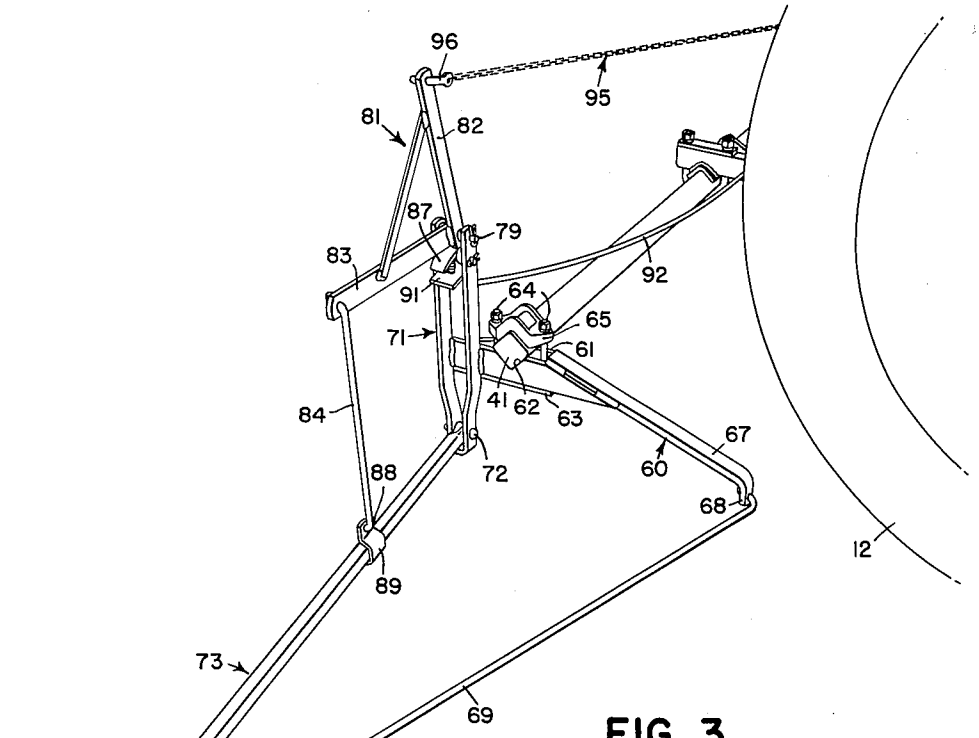


FIG. 3

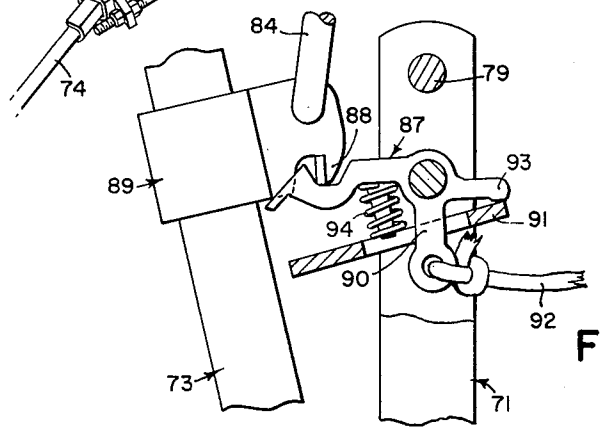


FIG. 4

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MARKERS FOR PLANTERS

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4 Claims. (Cl. 172—128)

The present invention relates generally to agricultural implements and more particularly to ground working and ground engaging implements, such as a planter, for example, having row marking means.

The object and general nature of the present invention is the provision of a new and improved marker control for implements of the type that are adapted to be carried by a tractor and raised and lowered by the latter into and out of transport and working positions, with means responsive to the movement of the implement relative to the tractor for automatically raising and lowering the markers under the selective control of the operator.

More specifically, it is a feature of this invention to provide a marker control that is so constructed and arranged that the markers are raised with a delayed action so that even though the implement be raised in a relatively short period of time, the markers are not swung upwardly into their raised position with objectionable velocity or acceleration. For example, there are many instances in which an implement, such as a tractor mounted planter of the lift type, in which the implement is raised from its operating position to its transport position in about one and one-half seconds, but it has been found that in cases where such an implement is equipped with a marker arm that extends, when lowered, laterally outwardly and is swung upwardly to a generally vertical position when the implement is arranged for transport, the direct connection of the marker arm with a planter that would cause the raising of the marker arm to be accomplished in the same length of time, namely one and one-half seconds, imparts a considerable velocity to the marker arm so that when the latter reaches its upper position, it strikes associated structure with a considerable impact, and further, in an implement of this kind, the marker arms are raised to positions generally alongside the operator on the tractor, and the excessive velocity imparted to the marker arms when raising them in the above mentioned one and one-half seconds, creates the appearance, if not the reality, of a serious hazard and possibility of injury to the operator that is exceedingly disconcerting.

Accordingly, it is an important feature of this invention to provide means for retaining the rapid raising of the implement as a whole while delaying the raising of the marker arm. Particularly, according to this invention, this result is secured by incorporating a spring in the lifting connections for the marker arm so that when the implement is raised energy is stored in the spring, as by stretching it, due to the resisting inertia of the marker arms in their lowered position, which energy is available even after the implement has reached its transport position to continue the raising of the marker arms. Further, as energy is withdrawn from the biased spring, the force exerted by the latter progressively decreases so that the marker arms are brought to their raised position in a relatively easy manner that does not result in objectionable impacts or too great a velocity in the raising direction.

An additional feature of this invention is the provision of means incorporated in the marker raising connection so that at a point adjacent the completion of the raising of the implement, and after the spring has been biased to a considerable extent, a direct positive connection is established so as to insure the initial movement of the marker arms out of their lowered position, starting them toward their raised position. However, the parts are so constructed and arranged that after this initial movement has been imparted to the marker arms, the biased spring takes over and continues the raising of the marker arms into their raised position.

These and other objects and advantages of the present invention will be apparent to those skilled in the art after a consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a rear view of a tractor mounted planter in which the principles of the present invention have been incorporated.

Fig. 2 is an enlarged perspective view showing the details of the connection between the tractor and the marker lifting chains.

Fig. 3 is a fragmentary perspective view of the marker arm supporting bracket structure.

Fig. 4 is a fragmentary detail view, partly in section, of the marker arm latch structure.

Referring first to Fig. 1, the implement is indicated in its entirety by the reference numeral **10**, and is shown as mounted on a conventional farm tractor **11**. The latter includes a pair of rear drive wheels **12** mounted on an axle structure **13** carried at the rear of the tractor and over which an operator's station, such as as a seat **14**, is disposed. The tractor also includes power lift means **15** which includes a rockshaft **16** on the ends of which lift arms **17** are fixed. Connected to the rear lower portion of the tractor, for example, to the lower rear drawbar structure **21**, is a pair of lower draft links **22** that are vertically swingable relative to the tractor, being connected to the side members of the drawbar support structure **21** by ball joint means **25**. Upper link means **26**, comprising a pair of rearwardly extending links **27** and **28**, is connected with the rear portion of the tractor above the lower draft links **22**, and the links **27** and **28** are interconnected by a crossbar **29**, the ends of which are connected by suitable means **31** to the rear ends of the links **27** and **28**. Both the upper and lower link means are adapted to be raised and lowered relative to the tractor by means of a pair of links **33** that at their lower end are connected with the lower draft links **22** and at their upper ends with the power lift arms **17**. The tractor power lift mechanism **15** is under the control of a valve lever **35**, and by moving the latter forwardly, the lower draft links **22** are raised, and by moving the valve lever **35** rearwardly, the draft links **22** are lowered. The upper link means **26** when connected with an associated implement, such as the planter indicated at **10**, move upwardly and downwardly with the lower links **22**.

The present invention is not to be limited to any particular type of implement, but for convenience in illustrating one form of the present invention, the implement **10** is in the form of a toolbar planter of the type that is adapted to be directly connected with the tractor. The planter **10** comprises a transverse toolbar **41** disposed immediately rearwardly of the tractor wheels **12** and connected by any suitable mounting means to the rear ends of the tractor draft links **22**. The toolbar **41** extends outwardly beyond the drive wheel **12** and carries suitable gauge wheels **43** journaled on the lower ends of gauge wheel attaching standards **44**, the latter being connected,

preferably adjustably, to the toolbar **41** by any suitable means. Secured to the generally central portion of the toolbar **41**, and forming with the latter an implement frame means, is a generally vertically extending mast structure **46**, preferably consisting of a pair of vertical bars **47** and **48** secured, as by welding, at the lower ends to the toolbar **41** and connected at the upper ends to an attaching bracket **51**, connected to the bars **47** and **48** by bolt means **52** and provided with a forwardly facing socket **53** adapted to receive the crossbar **29** of the upper link means of the tractor. The transverse bar **29** is held in place in the upper end of the attaching bracket **51** by a quick removable pin **55**.

According to the principles of the present invention, the planter **10** is provided with marker arm means and connections between the latter and the tractor so that whenever the planter is raised into a transport position, the marker arm means is raised into an inoperative position, and when the implement is lowered into its ground working operating position one or the other of the marker arms may be selected to be lowered, either as the implement is lowered or later, at the option of the tractor operator.

Fixed to each end of the transverse toolbar **41** is a marker arm supporting bracket structure **60**. This comprises a pair of generally fore-and-aft extending bars **61**, each having a notch **62** to receive the lower side of the associated toolbar **41**, and the lower rear portions of the bar **61** are interconnected by a horizontal plate **63** that is apertured to receive a pair of bolts **64** by which a clamping cap **65**, disposed on the upper side of the toolbar **41**, is secured to the lower fore-and-aft extending bars **61**. The upper edges of the forward portions of the bars **61** slope downwardly and receive, as by welding, the forwardly extending brace rod receiving section **67**, the forward end of which is downturned and apertured, as shown at **68**, to receive a marker arm brace rod **69**. Secured to the outer bar **61**, as by welding, is a vertical U-shaped bracket **71** having its lower portion extending downwardly below the bar **61** and apertured to receive a pivot pin **72** by which the inner end of the associated marker arm **73** is connected with the bracket structure **60** for generally vertical swinging movement. The marker arm **73** is longitudinally adjustable, comprising two sections **74** and **75** arranged in telescopic relation, the inner section **75** receiving clamp means **77** by which the outer end of the brace rod **69** is fixedly connected therewith.

The upper end of the bracket **71** is apertured to receive a pivot pin **79** that swingably supports a bell crank **81**, the latter including a generally vertical arm **82** and a generally laterally outwardly extending horizontal arm **83**. The outer end of the generally horizontal arm **83** is connected by a link **84** with the associated marker arm **73**, whereby rocking of the bell crank **81** in a generally transverse vertical plane results in raising and lowering the marker arm **73**. Disposed immediately below the bell crank is a marker arm latch lug **87** having a hook end that is adapted to be engaged with the hook portion **88** of the bracket **89** that connects the link **84** with the marker arm **73**, when the latter is raised into its vertical or transport position. An end **90** of the latch **87** extends downwardly through an opening in a stop plate **91** that is fixed, as by welding, to the side portions of the U-shaped bracket **71**, and to this end of the lug **87** a control rope **92** is connected. As best shown in Figure 4, a stop extension **93** on the latch **87** contacts the inner end of the plate **91**. A spring **94** moves the latch into marker arm engaging position. There is a marker supporting bracket and associated parts described above at each end of the toolbar **41**. Both control ropes **92** extend forwardly to a point closely adjacent the operator's station **14** on the tractor.

The operating mechanism whereby the raising and lowering of the implement relative to the tractor automatically operates the marker arms is of special construction and will now be described. Secured to the generally upwardly extending arms **82** of the bell cranks **81** is a transversely disposed flexible element **95**, preferably in the form of a cable or chain, the ends of the flexible element **95** being connected, respectively, to chain hook connectors **96**, and the central portion of the flexible chain **95** extends through pulley blocks **98** carried on a support member **101** that is detachably connected to the upper portion of the implement mast structure **46**. The support **101** includes a rear crossbar **102** that is apertured to receive eye bolts **103** that carry the pulley blocks **98**, and the central or bight portion of the chain **95** extends through a forward pulley block **105** that is carried by the rear portion of a resilient structure **106**. The latter includes a spring **107**, the forward end of which is adjustably connected, as by an eye bolt **108**, to a bracket **109** that is fixed directly to the rear part of the drawbar support **21** of the tractor. An extension limiting shackle means **111** is connected to limit the extension of the spring **106**. The shackle limiting means **111** comprises two chain lengths **113** the end links of which are welded, respectively, to a pair of arcuate straps **114** and **115**. The central portions of each of the strap members **114** and **115** are slotted, as at **116**, to receive an associated connection, one of the connections being the eye bolt **108** that connects the lower end of the spring **107** to the tractor drawbar support bracket **108**. The other connection is shown at **117** and serves to connect the upper end of the spring **107** to the pulley block **105**.

Under normal conditions of operation, as shown in Fig. 1, when the implement has been lowered to bring the planting units P, only one of which is shown in detail in Fig. 1, into operating position, one of the marker arms is lowered while the other is raised. The raised marker arm is held in position by virtue of the associated latch **87**. When the implement is to be raised into transport position it is also necessary to raise the down marker arm into a raised position, in which the marker arm extends generally vertically, thereby facilitating the passage of the outfit through gates, along narrow lanes and the like. Normally, the power lift unit of the tractor is so constructed and arranged as to raise the implement in a period of time of about one and one-half seconds, which is a fairly rapid rate but a desirable one since it facilitates the making of sharp quick turns at the end of the field.

It will be seen from Fig. 1 that in its operating position, the lower marker arm extends generally horizontally outwardly, and experience has shown that if the down marker arm is raised in substantially the same length of time, namely, one and one-half seconds, the marker arm swings upwardly with considerable acceleration, creating relatively large or objectionable impact forces. This is, at least in part, due to the fact that as the marker arms approach their raised position, they become almost vertical, and which position the effect of gravity, which is relatively great when the arms are in their horizontal or laterally outwardly extending position, becomes a minimum so that the raising effort required for the raising movement of the marker arms drops off rather sharply. A further result of this objectionable upward and laterally inwardly directed movement of the marker arms, when shifting them to their transport position, is to create the appearance of danger of the operator, at the operator's station **14** on the tractor, being hit by the upwardly and laterally inwardly moving marker arms. Actually, as can be seen from Fig. 1, this is not physically possible, but nevertheless a rapidly moving upwardly swinging marker arm creates the illusion of a hazardous condition, and is therefore objectionable to the operator who, at the time of making the turn, is required to give full attention to the manipulation of the tractor, and anything that detracts from this is a hazard.

According to the principles of the present invention we provide means whereby the raising of the marker arms is delayed beyond the relatively short period required for raising the implement. With particular reference to Fig. 2, from which it will be seen that the shackle chains **113** are slack, during the initial movement of the implement from its lowered position to its raised position, the upward movement of the implement acts through the spring **107**, one end of which is anchored to the tractor drawbar support, to pull downwardly on the bight part of the marker arm lift chain **95**. Due, however, to the weight and inertia of the down marker arm, the spring **107** is extended as the implement continues its upward movement and, with the proper adjustment at **108**, the spring **107** becomes extended substantially to the full permissive extent at about the point where the shackle chains **113** become taut, and this normally occurs at about the time the implement has reached its raised position, which is at the end of the one and one-half second period mentioned above. Preferably, the parts are so arranged that just a moment before the implement reaches its raised position, the chains **113** go tight and at this moment a positive force is exerted through the lifting chain **95** to start the marker arm toward its raised position. In the meantime, due to a raising movement of the implement, the spring **107** has a substantial amount of energy stored therein, and this becomes available to continue the upward movement of the marker arms, and which movement has been started by the direct anchoring connection **113** at about the end of the raising movement of the implement. The spring **107** then continues to exert a force lifting the down marker arm upwardly into its raised or transport position. It will be noted that as the stretched spring retracts, its effective force decreases, but this occurs more or less as the marker arm approaches its raised position, and in which, therefore, a decreased force is still sufficient to continue the swinging of the marker arm. With the proper adjustment of the spring anchoring member **108**, the spring is arranged to raise the marker arm into its completely raised position, in which position the catch latch **87** locks the marker arm in its raised position.

After the operator has turned the outfit around and is ready to start down the field, he actuates the power lift valve to lower the implement and also pulls on the rope connected with the latch that lowers the opposite marker arm into its operating position.

It will also be noted that, as can best be seen in Fig. 3, when the marker arm **73** is down the bell crank arm **83** extends outwardly divergingly relative to the marker arm **73**. This relationship can also be seen in the right hand portion of Fig. 1. By virtue of this angular relationship, when the marker arm moves up toward its raised position its rate of movement is gradually decreased as the link **84** comes into a substantially straight line relation with respect to the bell crank arm **83**, which occurs at about the time the marker arm is raised and latched. Thus, the velocity of upward movement of the arm gradually decreases as the arm approaches its raised position, which eliminates substantially all excessive impacts caused by the arm striking the stop plate **91** with excessive force. Further, as the down marker arm approaches its raised position, less power is required to lift the marker arm, as the arm **83** and link **84** approach their straight line position, and this occurs when the spring **107** exerts a lesser force. Thus, the effect of the decreasing effort exerted by the spring **107** and also the effect of the bell crank arm **83** moving substantially into a straight line relation with the link **84**, results in a gradual slowing down of the upward movement of the marker arms, thereby preventing excessive impacts and at the same time providing for easy operation in the raising of the marker arms.

While we have shown and described above the preferred structure in which the principles of the present invention have been incorporated, it is to be understood that our invention is not to be limited to the particular details, shown and described above, but that, in fact, widely different means may be employed in the practice of the broader aspects of our invention.

What we claim, therefore, and desire to secure by Letters Patent is:

1. In an agricultural implement adapted to be propelled by a tractor and having a part to be shifted relative to the tractor from one position to another by power in a relatively short period of time, the combination therewith of a marker carried by said part and adapted to be shifted between upper and lower positions, and means including a spring connected at one end with the marker and at the other end with the tractor, whereby when said part is shifted during said relatively short period of time said spring is biased so as to shift said marker into a raised position after the completion of movement of said part, and a substantially inextensible link extending generally alongside said spring and connected at its ends with both ends, respectively, of said spring, said inextensible link including lost motion and having a length, when said lost motion has been taken up, that is slightly less than the effective distance between said marker in the lower position and the point of connection of the spring with the tractor in the full raised position of the said part, whereby when the spring has been biased substantially the full permissible amount said link acts to transmit motion to said marker independently of said spring, so as to impart movement to said marker with sufficient force to overcome inertia of the marker and initiate movement of the latter toward its raised position, the force stored in the spring completing movement of the marker into its raised position.

2. The combination with a farm tractor having a lower drawbar support at the rear of the tractor and a pair of power operated generally vertically swingable draft links connected with the tractor, of an implement of the lift type having frame means, furrow opening means carried thereby, means connecting said frame means with said raising and lowering means, a pair of marker arms, one connected with each end of said frame means and swingable between an outwardly extending lowered position to an upwardly extending raised position, a cable extending transversely of the implement above said links and said drawbar support and having its ends connected with said marker arms, respectively, and a generally central bight portion, and a connection extending from said bight portion downwardly to the drawbar support of the tractor whereby the marker arm is raised whenever the implement frame means is raised.

3. The invention set forth in claim 2, further characterized by said connection comprising a pulley and block receiving said bight, a spring connecting said block with the drawbar support, and a chain extending from said drawbar support to said block and of such length that the chain is slack until the spring is stressed a substantial amount.

4. The combination with a tractor having a power lift apparatus and generally vertically swingable implement-receiving draft link means, of an implement adapted to be mounted on said draft link means and including implement frame means, marker arm means connected with said frame means for movement from a generally laterally outwardly extended operating position to a generally vertical position, a bell crank pivotally mounted on said frame means above said marker arm means and having two arms, a link pivotally connecting one of said bell crank arms with said marker arm means, said one arm and link being constructed and arranged so that they move substantially into a straight line relation as the marker arm approaches its raised position, a spring connected at one end with the tractor, and a flexible element connected between the other end of said spring and the other bell crank arm, the latter being disposed at approxi-

mately a right angle to said flexible element when said marker arm means is in its lowered position.

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